

States of Matter

Solid



Liquid



Gas



Plasma



Your turn...

Write four (4) examples each for Solids, Liquids, and Gases. Try to use examples you have personally been in contact with

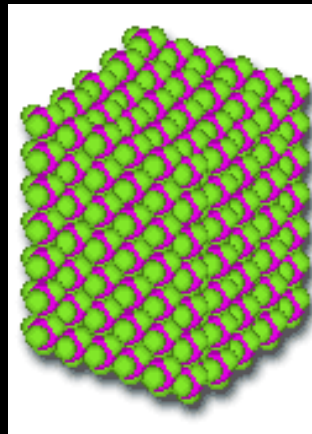
How they relate

Based on what you know about solids, liquids, and gases, how are the twelve (12) examples you came up with different, five (5) ways, and how are they similar, five (5) ways

The Three States of Matter We Will Consider...

Solids –

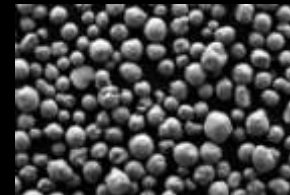
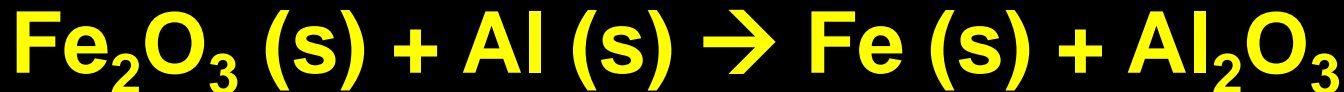
- Orderly arrangement of particles that compose it: atoms, molecules, or ions
- Held in close proximity and are held together by forces that keep them in fixed positions
- Do not flow; difficult to compress



The Three States of Matter We Will Consider...

Solids –

- Volume and shape are constant because of fixed position
- When heated, particles gain energy and the solid becomes a liquid
- Identified by and (s) in chemical equations



Recall

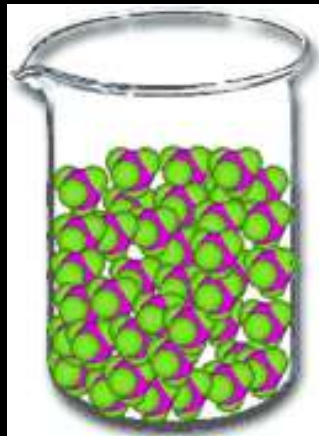
How do your “solids” that you listed fall into or are supported by the definition of a solid just listed?

Tell your neighbor and be prepared to share

The Three States of Matter *We Will Consider...*

Liquid –

- **Particles are farther apart than those of a solid, but still fairly close to one another**
- **Greater distance between particles allows them to flow**
- **Difficult to compress because the particles remain in contact even as they move about**



The Three States of Matter We Will Consider...

Liquid –

- Volume of a liquid is constant, but liquids can flow to change shape into that of its container
- Cooled = solid; heated = gas
- Identified by a (l) in a chemical equations



The Three States of Matter We Will Consider...

Gas –

- Very large distances between particles that are moving at high speeds – 300 m/s
- Can be compressed because of large spaces between particles
- Always fill the volume and shape of the container in which they are placed

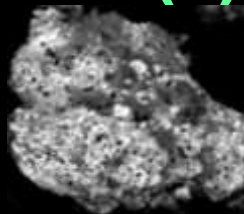


The Three States of Matter

We Will Consider...

Gas –

- Flow because particles are in constant motion
- Identified by a (g) in a chemical equations



Future Look: Stiochiometry



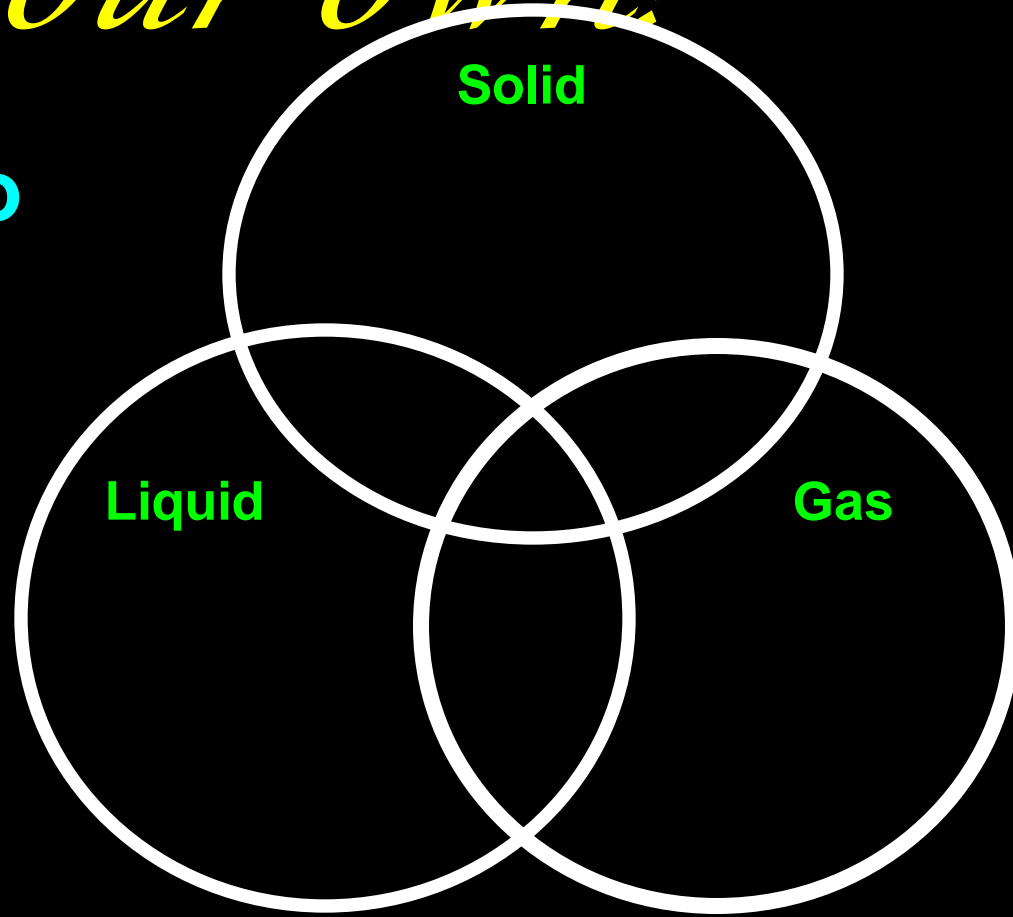
$$\frac{\text{gZn}}{1} \times \frac{1\text{molZn}}{65\text{g Zn}} \times \frac{1\text{mol H}_2}{1\text{mol Zn}} \times \frac{2\text{g H}_2}{1\text{mol H}_2} =$$

States of Mater link

http://www.google.com/url?q=http://www.youtube.com/watch%3Fv%3Ds-KvoVzukHo&sa=X&ei=1v9gTtXPOM_SiAKVtcGwDg&ved=0CDcQuAlwAA&usg=AFQjCNG2xSidH7SevFEYF8cep9yy5ae_rQ

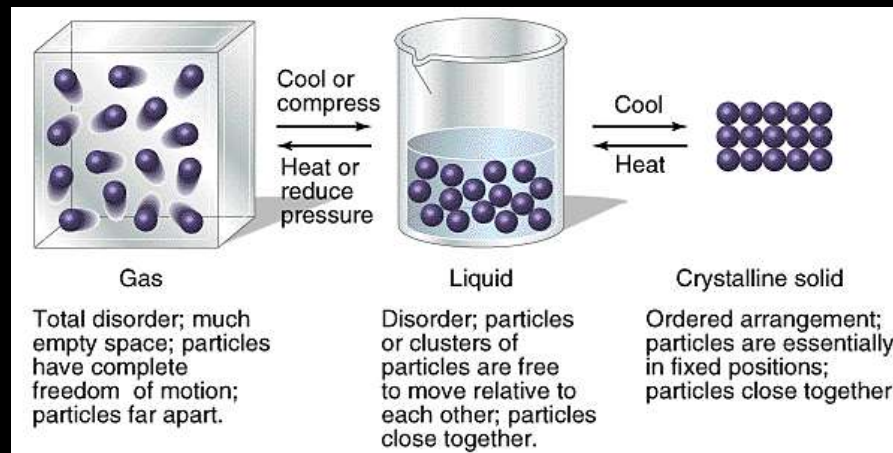
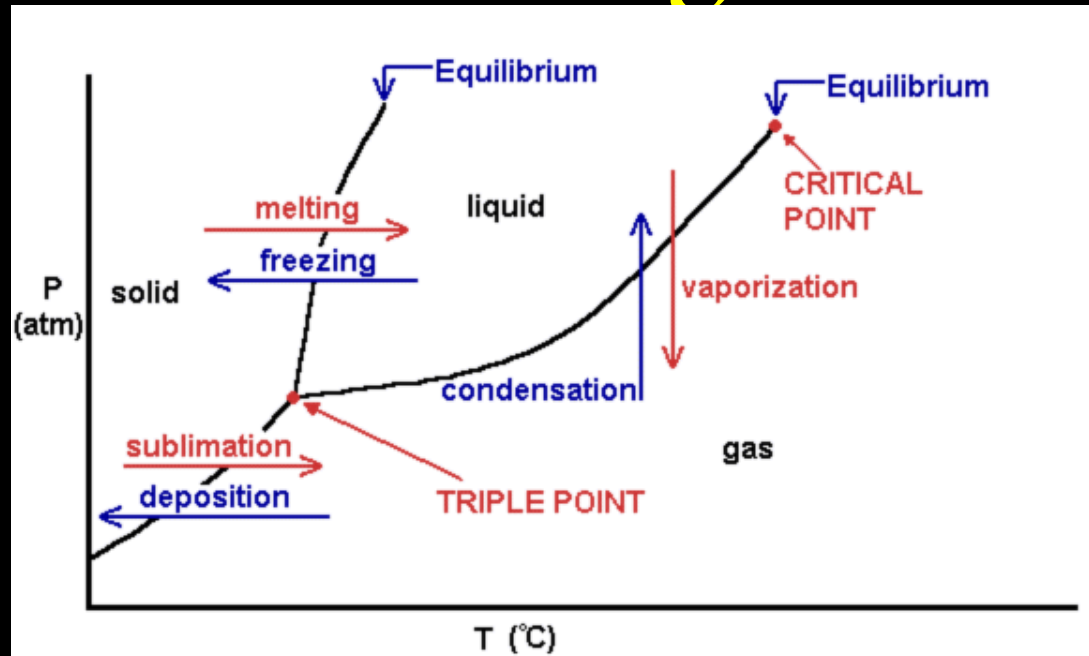
Make it your own!

Put these notes into
a different form
– a table or
Venn diagram!



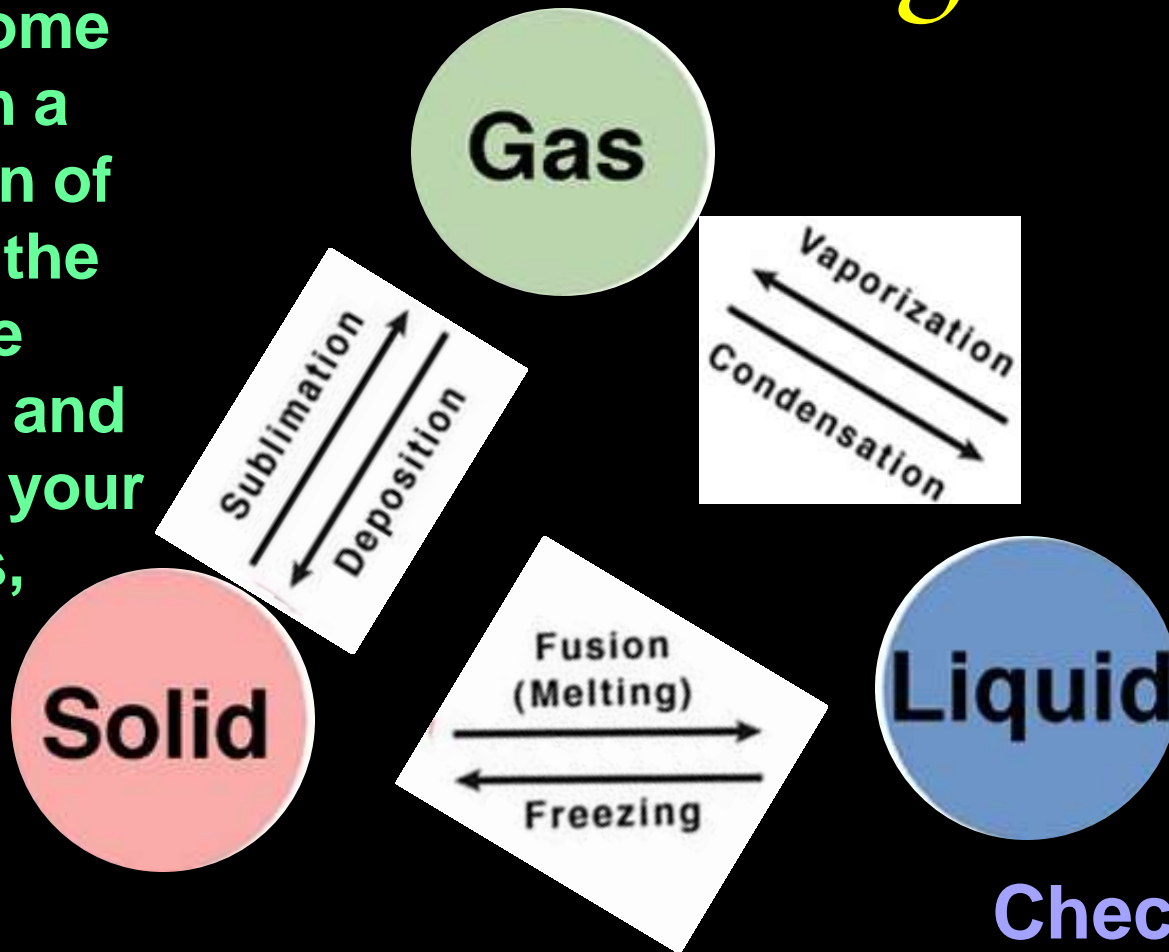
How would a bubble fit into
each of the states/ phases of
matter?

Phase Diagram



Phase Changes

Try to come up with a definition of each of the phase changes and record in your notes,



Check your definitions against the text book

Bell Work

15/16-Sept-2015

Have your Pre-Lab Out

I. What is the first separation technique you are going to use in the lab to day?

I am looking for a word (think phase changes).

II. Where should we complete this technique and why.

*EQ: Do you feel your education is a right
or a privilege?*

Objective

You will separate 2 of the 3 components in a mixture and be able to identify the separation techniques

Root Words

Philia or Philic- having an attraction or affinity for, liking

Ex. Hydrophilic, acidophilic, alkaliphilia, audiophilia

Data Set Up

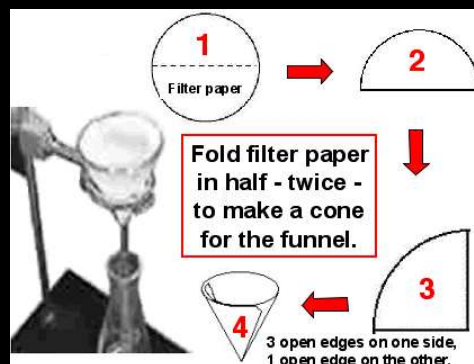
	Mass (g)	Mass Dish + Sample (g)	Mass of Dish after heating (g)	Difference in Mass, loss of mass (g)
Dish A (Steps 1-3)				
NH ₄ Cl				
Dish B				
Watch Glass				
NaCl				
Filer Paper			(Dry filer paper and solid)	
SiO ₂				

Separation of a Homogeneous Mixture

Separation #2



Separation #1



<http://crescentok.com/staff/jaskew/isr/chemistry/liquidkey.htm>



Separation #3

Separation of a Homogeneous Mixture

Day #1

We will be doing steps 1-9 today ☺

You will use set ups in hoods for step 2

Complete Step 5, 9, and 10 on Day 2



Separation of a Homogeneous Mixture

Day #1

Step 3, what is the caution there



Bell Work

15/16-Sept-2015

2nd Half

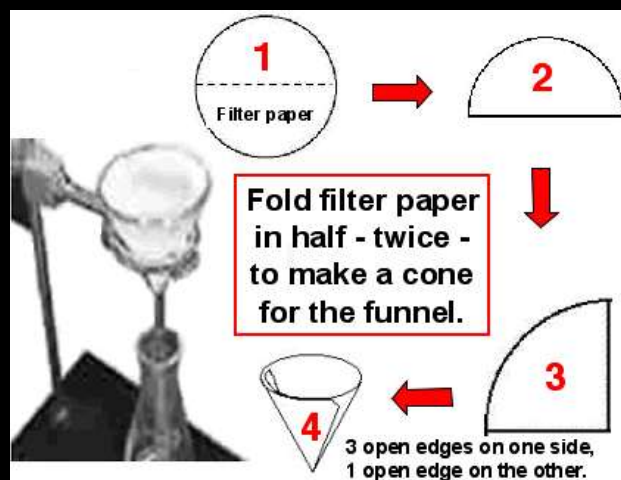
How are you going to complete the evaporation separation, draw a picture of what you think the set up will look like, label all of the pieces

Separation of a Homogeneous Mixture

Separation #2



Separation #1



Separation #3

Separation of a Homogeneous Mixture

When heating the filtrate, in the evaporating dish - use on a small to medium flame!



Separation of a Homogeneous Mixture

Before You Leave:

Describe what was removed in each of the steps and why we used this order for the separation of the mixture.

Which parts of the mixture are soluble in water? How do you know?

Time to Think...

A copper refiner produces a copper ingot having a mass of 1.71 lb. If the copper is drawn into wire whose diameter is 10.5 mm, how many m of copper wire can be obtained from the ingot? The density of copper is 8.94 g/cm^3

Bell Work

17-Sept-2015

During the “Separation of a Homogenous Solution” why did need to heat the mixture to remove the NH_4Cl before our filtration separation?

If 19.01g of ethanol $\text{C}_2\text{H}_5\text{OH}$, (density = 0.789g/ml) was dissolved in 85ml of water, what is the % ($\text{vol}_{\text{EtOH}}/\text{total}_{\text{vol}} \times 100$) composition of the solution?

*EQ: Do you feel your education is a right
or a privilege?*

Objective

Finish/ complete Day 2 of purification

Understand and be able to calculate percent
mass.

Separation of a Homogeneous Mixture: Day #2

In the lab you will find the mass of the last component in the filter paper (SiO_2).

Make sure you do not loose any of the SiO_2 while moving it to weigh

Percent composition = $\frac{\text{grams of part}}{\text{total mass}} \times 100$

When you have finished the post lab questions, try to draw out a pictorial description of what you did to separate the mixture.

Percent Composition

There were three (3) substances in the solution: _____, _____, _____

So the percent composition for SiO_2 would be:

$$\% = \frac{\text{Mass SiO}_2}{\text{Mass of Mixture}} \times 100$$

Sample Data

Data:

	Mass (g)	Mass Dish + Sample (g)	Mass of Dish after heating (g)	Difference in Mass, loss of mass (g)
Dish A (Steps 1-3)	30.20	32.90	32.70	0.20
NH ₄ Cl	0.20			
Dish B	30.20	NA	30.59	0.39
Watch Glass	NA	NA	NA	NA
NaCl	0.39			
Filer Paper	1.13	NA	(Dry filer paper and solid)	3.23
SiO ₂	2.10			

Sample Percent Composition

So the percent composition for SiO_2 would be:

$$\% \text{SiO}_2 = \frac{2.1\text{g}}{2.7\text{g}} \times 100 \rightarrow \underline{\hspace{2cm}}$$

So the percent composition for NH_4Cl would be:

$$\% \text{NH}_4\text{Cl} = \frac{0.2\text{g}}{2.7\text{g}} \times 100 \rightarrow \underline{\hspace{2cm}}$$

So the percent composition for NaCl would be:

$$\% \text{NaCl} = \frac{0.39\text{g}}{2.7\text{g}} \times 100 \rightarrow \underline{\hspace{2cm}}$$

Why do they not add up to 100% ?

BELL WORK

18-SEPT-2015

You worked 30hrs at your job at a pay rate of \$21.50/hr, but taxes took 21% of your check.

Your electric bill was \$50, gas was \$25, water bill was \$42, car payment was \$110, your rent was \$200, and phone bill was \$35.

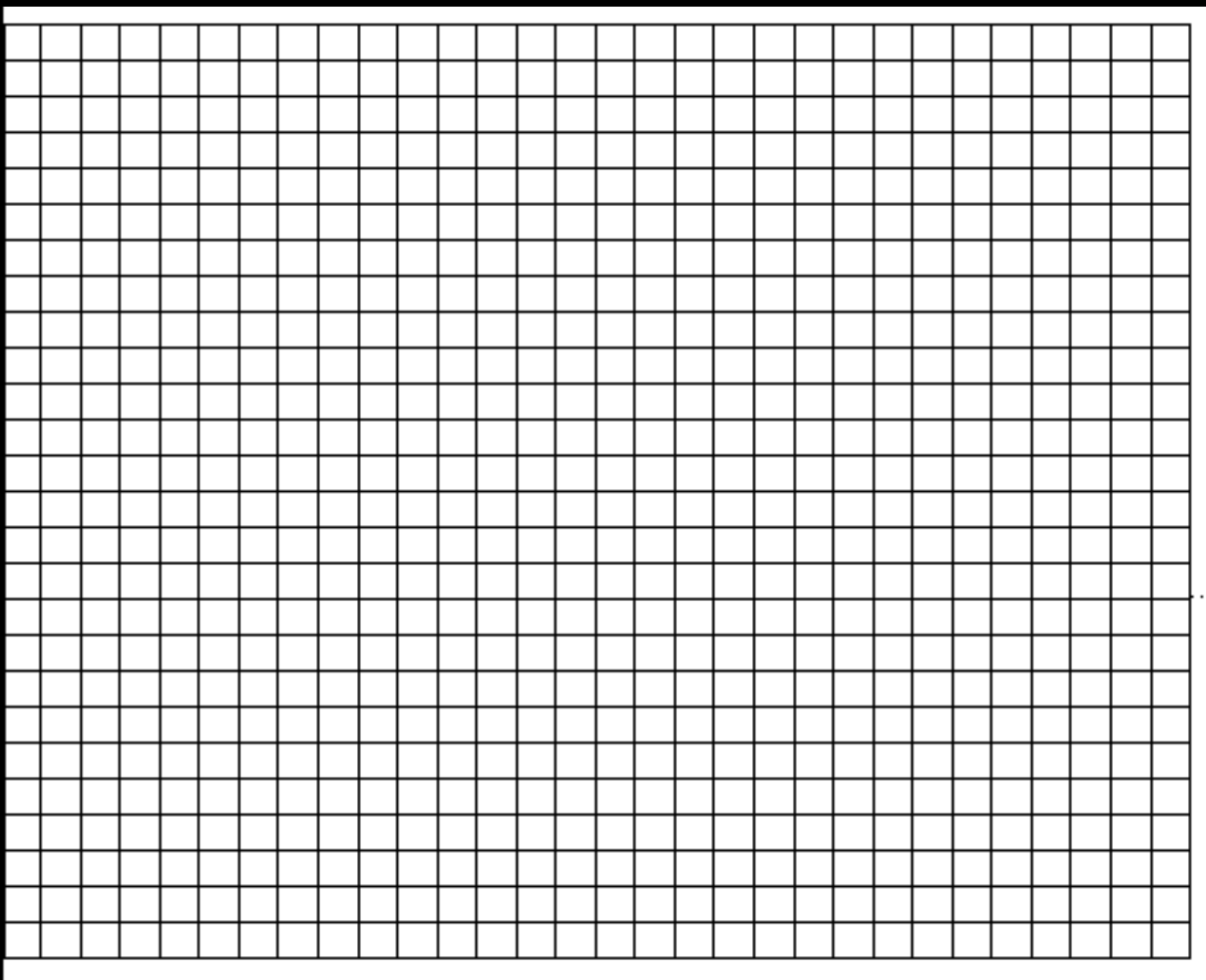
A. How much money do you have left over for “fun”, savings, shopping, etc.?

B. What was your percent yield from the original non taxed amount?

Objective

Finish Purification Lab

Be able to classify matter



What is a physical change?

A **physical change** occurs when a substance changes states but **NOT** chemical composition.

For example:

water freezing into ice,

cutting a piece of wood into smaller pieces, The form or appearance has changed, but the properties are the same melting point, boiling point, chemical composition, etc.

Characteristics of Physical Properties

Melting point

Boiling point

Vapor pressure

Color

State of matter

Density

**Electrical
conductivity**

Solubility

**Adsorption to a
surface**

Hardness

What are chemical changes?

A **chemical change** occurs when a substance changes into something **new**.

This occurs due to heating, chemical rxn, etc. You can tell a chemical change has occurred if the **density***, **melting point** or **freezing point** of the original substance changes.

Common signs of a chemical change can be seen (**bubbles forming**, **mass changed**, etc).

Characteristics of Chemical Properties

Rxn with acids

**Rxn with bases
(alkalis)**

**Rxn with oxygen
(combustion)**

**Rxn with other
elements**

**Ability to act as
oxidizing/
reducing agent**

**Decomposition into
simpler
substances**

Corrosion



Sublimation of I_2



What did we do to cause the sublimation of I_2 ?



What did we do to allow the deposition $I_2 (g)$ to $I_2 (s)$?

You Think

**What are three
(3) examples of
physical
changes you
have seen?**

**What are three
(3) examples of
chemical
changes you
have seen?**

Separation of a Homogeneous Mixture

Post lab Question 10.

Draw out all of the set ups for the three separation we conducted. Label the components in each.

Home Work

18.Sept.15

Read p56-62 in text complete problems #5-9
in text chapter,

Use resource to classify matter as pure
substance or mixture.

Then further what are two classes of a pure
substance?

What are two classes of mixtures?

Test Question Recap

In small groups you will workout ***all*** question from the test showing ***All Steps*** needed to arrive at the correct solution.

Your group must be able to explain how to get the answer so ***Everyone*** in the class understands how.

Recall

Three (3) signs of a chemical change could be...?

What is the volume occupied by 35mg of gallium with a density of 5.32g/cm^3 ?

Draw a phase diagram for water (H_2O) disregarding actual values for Pressure and temperature. Include the triple point and critical point.

Matter: Pure Substances & Mixtures

Matter and evidence from a crime scene may be either a pure substance or a mixture.

A Pure substance is any form of matter that has a uniform composition and cannot be separated by physical methods such as filtration or evaporation into more than one component

Pure Substances: Elements and Compounds

Elements and compounds are two subclasses of pure substances.

An element is the simplest form of a pure substance.

- **Elements are made of ATOMS – the smallest component of matter that retains all the properties of matter**
- **Each element has unique atoms that are unlike the atoms of any other element.**

Pure Substances: Examples of Elements

EX. Al found in aluminum foil



Lithium, often found in clandestine drug labs where methamphetamine is manufactured.

What are three (3) examples of matter in ELEMENTAL form that you have used?

Phase change of Br₂ Gas



What are the names of the two processes above?

Br is a diatomic gas at room temp. Find it on the periodic table?

What other elements are in the same column?

Name two other elements that are gasses at room temp. (25°C)

Time to Think...

A 27.15 g sample of a solid is placed in a flask. Toluene, in which the solid is insoluble, is added to the flask so that the total volume of completely submerged solid and liquid together is 53.71 mL. The solid and toluene together have a mass of 67.58 g. The density of toluene at the temperature of the experiment is 0.9247 g/mL. What is the density of the solid in g/cm³?

Recall

What are two (2) types of mixtures, and how are they different?

Think back to the book work from last Friday.

Recall

Name two differences in physical or chemical change.

Density Recall

If the surface area of a projected new iPhone 7 is $7,800.5\text{mm}^2$ and you are instructed to design a protective plastic cover no more than 0.200mm thick, what is the mass of the plastic you should use if its density is 1.19g/cm^3 ?

Pure Substances: Compounds

Matter found in elemental form at a crime scene or anywhere else is rare because most elements react with other substances to form compounds.

A compound is a substance that is made up of two or more elements chemically bonded together.

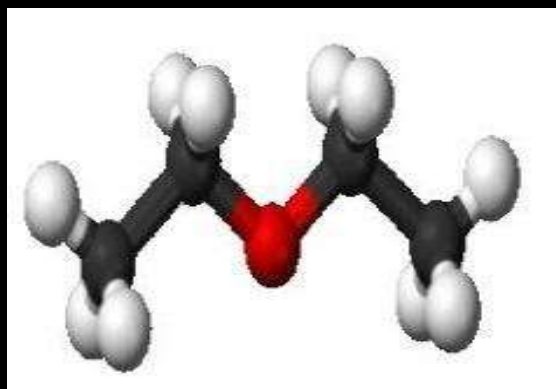
The elements that make up compounds cannot be separated by physical methods but only by a chemical reaction.

Pure Substances: Compounds

Examples of compounds:

- Sodium chloride (**NaCl**) found in common table salt, in which Na is bonded to Cl
- ethyl ether - in which carbon, hydrogen, and oxygen are bonded in a chemical combination;

What are three examples of COMPOUNDS that you have used?



MIXTURES: Homogeneous & Heterogeneous

**Mixtures – two or more substances
physically combined but NOT
chemically bonded together.**

***Mixtures can be separated into their
components by physical means such
as evaporation or filtering.***

**EX: In order to separate salt from a salt
water solution. Just boil the water off.**

Heterogeneous Mixtures

The composition varies from one region of a sample to another

Types of mixtures: **Suspensions**

What are four (4) examples of HETEROGENEOUS mixtures that you have used?



Homogeneous Mixtures

Substances are so evenly distributed that a sample from any one part of the mixture will be chemically identical to a sample from any other part.

Only one phase is present

- EX: sugar dissolved in water;
- Colloid: Fog, Jello, etc
- EX: Air, and blood.



Mixtures – Homogenous mixtures



**What are four (4) examples of
HOMOGENEOUS mixtures that
you have used?**

Ponder this...



What type of mixture is this?

Physical And Chemical Changes Lab

You will have 6min per station.

Some of the stations will only take a few minutes, while waiting complete the assigned question at the lab bench, they all must be completed.

Finish station 1-7 in class today

Your Conclusions

#	Start Materials	3 Observations of starting materials	3 Observations during Rxn	3 Observations after rxn	Chemical Or Physical Change?
1					
2					
3					
4					
5					
6					
7					

Closure

IN YOUR NOTES, make a flow chart or web outlining Matter and its constituents.

Hint we have not looked at mixtures during class yet, only pure substances...

